

RF



VOL. I NO. 7 P.O. Box 3454, Tustin, CA 92781-3454 July 2009

The PREZ Says:

This has been an outstanding field day! The last minute location change has proven that what matters is the team spirit and the collective willpower to achieve our goals. After all, Field Day is a simulated emergency operation, not a pre-planned contest. Aside from the raw number of QSO's (almost 6000), it was great to see people operating around the clock, non-hams learning and operating and people having fun. I want to personally thank everyone who participated, not only from OCARC but also from WARA and CARA. Their help made the difference between very good and extraordinary. I wish next year we can repeat or even better this year's success. It is now time for the OC Fair and the VP and I hope that everyone has a chance to at least stop by the amateur radio booth if not work at the booth. It is a great time to get people informed and interested in our amazing hobby. You can also practice your Morse code skills with the kids!

73 DE NICHOLAS AF6CF

Upcoming Meeting: Friday, July 17th - Join Dennis Kidder on a radio astronomy trip that will cover the history of radio astronomy and the contributions of amateurs. You definitely won't want to miss it!

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**THE ORANGE
COUNTY
AMATEUR RADIO**



Club Dues:

Regular Members...\$20

Family Members*...\$10

Teenage Members...\$10

Club Badge**...\$3

Dues run from Jan. through Dec. & Are prorated for new members.

* Additional members in a family of a regular member pay family rate up to \$30 per family

** There is a \$1.50 charge for the badge being mailed to you.

ORANGE COUNTY AMATEUR RADIO CLUB – W6ZE

2009 Board of Directors:

President:

Nicholas Haban, AF6CF
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2009 Club Appointments:

W6ZE club license trustee:

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(714) 557-7217
k6vdp@w6ze.org

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(714) 573-2965
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OCCARO Delegate:

Steve Brody, N1AB
(714) 974-0338
n1ab@w6ze.org

MONTHLY EVENTS:

General Meeting:

Third Friday of the month
at 7:00 P.M.
AMERICAN RED CROSS
601 N. Golden Circle Dr.
(Near Tustin Ave. & 4th St.)
Santa Ana, CA

Club Breakfast:

First Saturday of the month
at 8:00 am
Jaugerhaus
2525 E. Ball Road
(Ball exit off 57 freeway)
Anaheim, CA

Club Nets (W6ZE):

7.086 ± MHz CW OCWN
Sunday 9-10 a.m.
John WA6RND, Net Control

28.375 ± MHz USB
Wednesday 7:30-8:30 p.m.
Bob AF6C, Net Control

146.55 MHz Simplex FM
Wednesday 8:30-9:30 p.m.
Bob, WB6IXN, Net Control

"RF"

ORANGE COUNTY AMATEUR RADIO CLUB

JULY 2009

FIELD DAY SUMMARY
FOR
THE ORANGE COUNTY AMATEUR RADIO CLUB - W6ZE

by: Ken / W6HHC & Bob / AF6C

YEAR	160M SSB	80M CW	75M SSB	40M CW	40M SSB	20M CW	20M SSB	15M CW	15M SSB	12M SSB	10M CW	10M SSB	6M CW	6M PHN	2M CW	2M PHN	220 PHN	440 PHN	UHF CW	UHF PHN	ATV	RTTY PKT	SAT- ELLITE	GOTA	---- TOTAL ---- QSO's / (POINTS)
2009	0	277	126	838	807	974	970	495	368	0	5	450	11	375	0	125	18	20	1	0	0	0	2	130	5,992 / 17,446
2008	0	179	204	690	405	411	878	141	43	0	22	68	15	135	0	34	2	14	0	3	0	0	5	16	3,265 / 9,468
2007	1	356	310	910	830	988	1285	381	320	0	18	150	9	145	2	175	40	70	2	9	0	2	11	142	6,156 / 17,648
2006	0	28	20	89	512	156	664	16	10	0	0	0	0	38	1	85	0	7	0	0	0	114	0	113	1,853 / 4,514
2005	0	113	6	158	481	337	534	122	17	0	0	0	0	74	0	36	16	20	0	0	0	0	0	31	1,945 / 5,350
2004	0	166	239	37	412	131	477	31	105	0	1	114	0	0	0	46	12	20			0	0	1	0	1,792 / 4,316
2003	0	0	85	52	127	27	295	0	191	0	0	41	0	52	0	64	1	13			0	0	0	0	948 / 2,054
2002	0	26	69	192	279	76	229	0	485	0	0	18	0	62	0	68	6	10			3	2	0	3	1,528 / 3,648
2001	0	0	25	101	251	0	432	0	675	0	0	109	0	48	0	28	1	0			0	0	3	-	1,673 / 3,548
2000	0	19	20	88	91	0	625	0	794	0	0	121	0	36	0	72	7	15			0	0	1	-	1,889 / 3,992
1999	0	13	20	15	237	0	996	0	724	0	0	22		5	0	2	0	0			0	0	0	-	2,034 / 4,124
1998	0	24	75	65	136	100	250	0	624	0	0	82		0	0	46	17	12			0	7	1	-	1,439 / 3,270
1997	5	81	131	83	306	150	853	14	275	0	0	106		32	0	79	4	0			0	32	1	-	2,152 / 5,024
1996	-	146	228	104	125	283	673	40	605	0	0	217		121	0	32	0	40			0	13	1	-	2,628 / 6,428
1995	-	145	272	203	94	443	572	51	451	0	0	131		66	0	93	29	8			0	33	6	-	2,597 / 6,944
1994	-	114	114	208	45	486	748	85	761	0	13	312		58	0	94	33	0			0	31	0	-	3,102 / 8,078
1993	-	150	100	159	81	530	700	131	812	0	0	179		40	0	86	12	16			0	35	0	-	3,061 / 8,132
1992	-	0	294	200	110	541	555	0	840	0	0	232		13	0	74	0	1			2	41	80	-	2,983 / 7,530
1991	-	105	308	182	182	400	623	9	463	0	0	104		4	0	141	23	11			0	48	0	-	2,626 / 6,740
1990	-	0	0	70	144	0	370	0	747	0	0	131		39	0	114	14	26			0	2	-	-	1,657 / 3,454
1989	-	30	0	98	5	0	906	21	172	0	0	238		3	0	121	24	9			1	18	-	-	1,646 / 3,590
1988	-	127	0	93	75	2	359	0	570	0	144	81		0	0	32	0	-			-	14	-	-	1,497 / 3,726
1987	-	22	0	0	39	0	708	0	18	1	117	0		1	0	51	0	-			-	5	-	-	962 / 2,202
1986	-	0	46	219	78	0	488	0	45	10	0	0		0	0	82	0	-			-	0	-	-	968 / 2,374
1985	-	85	0	315	91	35	662	78	0	-	0	0		0	0	22	0	-			-	-	-	-	1,288 / 3,602
1984	-	18	0	313	0	32	196	32	350	-	0	0		0	0	0	0	-			-	-	-	-	941 / 2,672
1983	-	3	93	200	0	0	776	0	995	-	0	43		18	0	16	1	-			-	-	-	-	2,145 / 4,696
1982	-	0	105	59	238	40	352	19	515	-	0	72		0	0	155	27	-			-	-	-	-	1,582 / 3,400
1981	-	0	167	200	265	60	699	77	717	-	0	105		0	0	197	0	-			-	-	-	-	2,487 / 5,648
1980	-	20	149	205	235	471	318	52	1,025	-	0	226		12	0	100	36	-			-	-	-	-	2,849 / 7,194
1979	-	0	195	198	92	42	773	0	737	-	0	95		0	2	124	8	-			-	-	-	-	2,266 / 5,016
1978	-	16	196	246	170	30	981	57	558	-	13	145		0	1	164	23	-			-	-	-	-	2,600 / 5,926
1977	-	25	243	182	199	0	843	81	486	-	4	309		0	4	234	0	-			-	-	-	-	2,610 / 5,812
1976	-	99	254	152	487	21	600	64	210	-	2	54		0	0	2	0	-			-	-	-	-	1,945 / 4,566
1975	-	80	120	154	274	40	863	140	259	-	0	123		0	0	0	0	-			-	-	-	-	2,053 / 4,934
1974	-	6	161	6	333	0	630	12	342	-	0	110		0	0	0	0	-			-	-	-	-	1,600 / 3,248
1973	-	90	226	0	452	0	932	0	273	-	0	0		0	0	46	0	-			-	-	-	-	2,019 / 4,218
1972	-	0	50	0	350	0	521	0	530	-	0	0		0	0	94	0	-			-	-	-	-	1,545 / 3,090
1971	-	0	274	0	106	0	530	0	136	-	0	0		0	0	0	0	-			-	-	-	-	1,046 / 2,092
1970	-	0	272	0	0	0	531	0	426	-	0	0		0	0	0	0	-			-	-	-	-	1,229 / 2,458
1969	-	0	98	0	50	0	375	0	301	-	0	0		0	0	169	0	-			-	-	-	-	993 / 1,986
1968	-	10	224	62	396	93	328	24	430	-	0	68		0	0	145	0	-			-	-	-	-	1,780 / 3,938

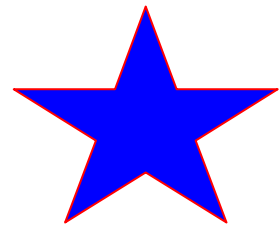
Note: These are raw contacts taken directly from the log sheets. Adjustments have not been made for duplicate contacts, and bonus points have not been added yet. Final scores appear in QST.

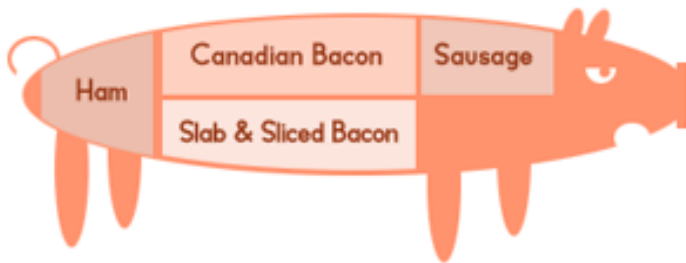
Attention Members!!!

Do you know a fellow ham that would be interested in joining OCARC? Do you have a friend that is curious about ham radio and wants to learn more about our hobby? Why not invite him or her to one of our exciting monthly meetings?!?! The meetings are fun, informative and entertaining. And don't forget about the raffle prizes too. So bring a visitor to one of our meetings, and help **your** club expand! Make sure to inform your friends of our club's website, which is always kept up to date. Information on club meetings, activities and our newsletter archive make it a worthwhile site to surf! <http://www.w6ze.org>

2009 ARRL CONTEST SCHEDULE

- July
11 - 12 IARU HF World Championships
- August
1 - 2 ARRL UHF Contest
15 - 16 ARRL 10 GHz and Up Contest
- September
12 - 13 ARRL September VHF QSO Party
19 - 20 ARRL 10 GHz and Up Contest
- November
7 - 8 ARRL November Sweepstakes (CW)
21- 22 ARRL November Sweepstakes (Phone)
- December
4 - 6 ARRL 160 Meter Contest
12 - 13 ARRL 10 Meter Contest





Ham Cuisine

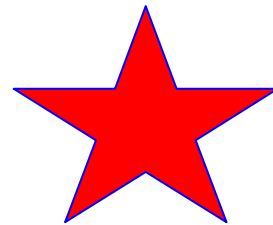
by Dale Piedfort, KB7UB

UB's Pulled Pork

Ingredients:

1 (3-5) lb. pork roast any style - I used a pork shoulder butt roast from Stater's Bros. They have good flavor with the BBQ sauce and shred well. Picnic roasts are the other one also traditionally used for pulled pork.

1 lg. sweet onion chopped
2 cups apple juice
2 tsp. coarse black pepper
2 Tbsp. mustard
2 Tbsp. Liquid Smoke, hickory flavor
1 cup barbecue sauce, regular flavor



Directions:

Heat just enough oil to make the bottom of your Dutch oven glossy (or use a roasting pan with lid).

Brown the roast on all sides, browning the onions in the same pan after browning the meat.

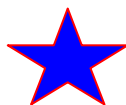
Add the apple juice, pepper, mustard, and Liquid Smoke.

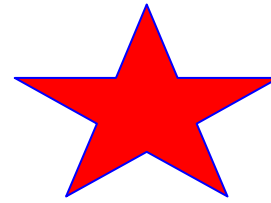
Broast at 325 degrees for 2-3 hours or until the meat can be pulled apart with two forks easily.

Add the BBQ sauce and then pull all the rest of the meat apart with forks before serving.

For a milder taste, add the BBQ sauce to the other juices before cooking. It's absolutely delicious!!!
If cooking a larger roast, cook at 350 degrees for 3-4 hours. A larger roast will cook faster if you cut it in half before cooking. Brown both pieces of meat.

You can find several uses for Pulled Pork. Eat it as is, make burritos/tacos, add it to rice dishes, make Sloppy Joes or Use your creative chiefs imagination to make new and different meals.





Member Spotlight

– **Chip Margelli, K7JA** –

Interview by: Kristin Dankert, K6PEQ

Q: When did you become a ham?

A: Got my Novice license in January of 1963, my General in May of 1964, and my Extra in August of 1968, so I've been licensed over 46 years. All tests were taken at the FCC office in Seattle, Washington.

Q: What were your previous callsigns, if any?

A: KN7VPF as Novice, and K7VPF 1964-1968.

Q: How did you originally get interested in amateur radio?

A: My playmate, Steven Pruitt, got me going; his Dad was K7ATF, and he was my early Elmer.

Q: Did you have any Elmers? If so, who?

A: Besides K7ATF, W5QQQ (now K7QQ) was my contest Elmer.

Q: What is your favorite band? Why?

A: Probably 15 meters, because it is above the zoo on 20 and yet it has some characteristics of VHF. Second preference is six meters, although she is a cruel mistress.

Q: Do you prefer CW, SSB, or digital? Why?

A: CW (the first digital). I like the sound of it, I like the skill set involved, and I like the transmission efficiency of CW.

Q: What aspects of amateur radio do you most enjoy?

A: I love building antennas, as anyone who visits our Field Day locations will know. Six meter antennas are not bad mechanically, so I like fiddling with them, but I never met a homebrew antenna I



didn't like. Straight, manufactured elements don't work right.

Q: What is your most memorable QSO?

A: My first QSO with K6PEQ, of course! (Yeah, right! LOL) My QSO with JY1, King Hussein, is right up there, though.

Q: Have you ever received an "OO" notice?

A: Yes, as trustee of KP2AA I received an OO notice for operation above the high end of the 20-meter phone band during Field Day a few years ago. I wasn't at the mic, so the investigation is still open.

Q: What radio and equipment do you use at your station?

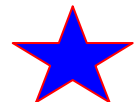
A: I use an IC-7800 primarily, along with an FT-847 for 2 meters. Also use a Yaesu Mk-V FT-1000MP and FT-1000D from time to time. And I use the FT-817 for portable HF/VHF work.

Q: What is your favorite QSL card received?

A: Probably the card I received from Ernst Krenkel, RAEM, is the coolest. He was "Hero of the Soviet Union" for saving the crew on an Arctic research ship (he was the radio officer), so the Russian FCC gave him the medal as well as the callsign of the ship. It has a very high cool factor.

Q: How many DXCC countries do you have confirmed?

A: Gee, not sure. Probably 320, but I haven't sent in a card since about 170 countries!



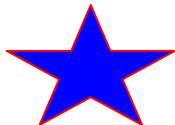
This was Chip at the CQ dinner looking very dapper! Thank you Chip for letting us know a little bit more about your love of our great hobby!

Submit an Article

Do you have an idea for a newsletter article? Maybe you have acquired a new piece of equipment, designed or constructed a new antenna, took a trip focused around ham radio, want to share an amateur radio related experience or discuss a technical topic. Why not write an article for the monthly RF



newsletter? The article can be short or long, simple or elaborate, and can even include pictures! The RF newsletter relies on articles from our members. So why not give it try? Write an article and send it to the newsletter editor. It's fun, and at the same time, your contribution helps support our club and hobby!



ORANGE COUNTY FAIR - 2009

The OC Fair has begun!! OCARC is manning the booth on Saturday, July 18th and Wednesday, August 5th! Thank you so much for the volunteers who are working the booth! The new booth area is fantastic and should be a lot cooler than previous years even maybe needing a jacket at night! Make sure to stop by and visit the OCCARO booth when you go to the fair, sign in and say hi! Take a friend by the booth and show them what our great hobby is all about! I hope to see you there!

OCARC Field Day 2009

Walter Knott School - Buena Park



**A HISTORY OF THE ORANGE COUNTY
AMATEUR RADIO CLUB - Part 17****by Bob - WB6IXN, Club Historian******* THE MODERN ERA – cont'd *******2000**

Larry Hoffman, K6LDC, became our Y2K president! Finding an accelerant at the fire scene, firemen suspected arson as the cause of the Candy Store (HRO) fire in Anaheim! The Club moved the Saturday Breakfast to the Azteca Restaurant, located at the old Wildflower Restaurant site on Grand Avenue in SA. Later in April, the Club Saturday Breakfast moved again, this time to the Hometown Buffet, 17th St. in Santa Ana.

Five OCARC members: Gene, KF6TRA; Larry, K6LDC; Cindy, KC6OPI; Don, KC6ONZ; and Roy, W5RT, all picked up their Red Cross Certification Cards as Disaster Relief Communicators. In January, 2000, the monthly 'NETNEWS' blog moved to the Club WEB site, and no longer appeared in the hard copy of the 'RF' Club paper. Ida, the widow of Kei-W6NGO, presented a check for \$450 to the Club from The Kei Yamachika Trust Fund.

May 5-7, 2000, found the Club 'Not-so-DXpedition' on private land owned by a friend of Art-KE6WOX in Aguanga (near Temecula). Jim-KE6UCH (now AE6UC) & Cory-KE6WIU (now AE6GW) got lost, but thanks to 146.55 & GPS, they soon arrived at the site. K6VDP, K6LDC and KE6WOX arrived early, followed by KE6UCH, KE6WIU, WA6PFA, and WA6VPP, with the OPs scoring DX in Italy, Croatia, British Columbia, and Chile, among others!

To escape the blistering heat of Yucca Valley for FD, the OCARC Field Day site was moved back to civilization at the Garden Grove Park on Atlantis Way in GG. Larry Beilin, K6VDP, was Field Day Chairman and Frank Smith, WA6VKZ was Field Day Chief Cook & Bottle Washer! The Club operated 3A with a Field Score: 2,260 QSOs for 4,734 points. Field Day was taped for cable TV viewing by the local Time-Warner Affiliate. It aired on cable Channel 3 in Garden Grove, Huntington Beach, and Westminster.

OCARC participated for the 14th year (and final time) in the Heel & Wheels Driving Club 3-day horse carriage event that benefits the 'Ride to Fly' equine therapeutic program for the disabled on the Palos Verdes Peninsula. There are carriages with sometimes as many as 4 horses pulling them, according to Bob, KD6XO. The Club provided 22 hams to help with the Marathon on August 12, providing OPs at various locations on the course to keep officials in touch with any emergency that occurred. See

the OCARC Photo Gallery on WEB site for the pictures of the event in 2000. The yearly horse carriage event permanently moved to Northern California in 2001.

The Club garnered \$137 profit from Auction proceeds. The annual OCARC Christmas Party was held at Mimi's Café in Fountain Valley. Bud Barkhurst, WA6VPP, received the "W6NGO-For the Good of the Club" award. Bob Tegel, KD6XO, on behalf of Heels & Wheels Carriage Club, presented OCARC with a donation check for \$500 as thanks for many years of communications help! The club approved the decision to convert the RF Newsletter to WEB distribution (instead of paper) beginning in 2001.

INDEX

The History of OCARC Series was created by club historian, Bob Evans WB6IXN, to help celebrate and preserve the 75 years of club history since the OCARC was founded in 1933.

The GOOD OLD DAYS

- Part 1 1933 – 1937 Mar 2008 RF
- Part 2 1939 – 1942 Apr 2008 RF
- Part 3 pre-war hams May 2008 RF

The POST WAR YEARS

- Part 4 1945 – 1953 Jun 2008 RF

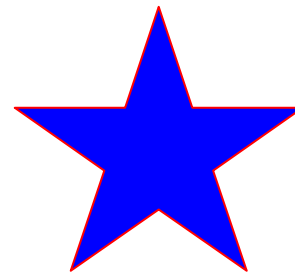
A NEW ERA

- Part 4 1958 Jun 2008 RF
- Part 5 1959 – 1965 Jul 2008 RF
- Part 6 1966 – 1968 Aug 2008 RF
- Part 7 1969 – 1977 Sep 2008 RF
- Part 8 1977 – 1980 Oct 2008 RF
- Part 9 1981 – 1985 Nov 2008 RF

The MODERN ERA

- Part 10 1986 – 1987 Dec 2008 RF
- Part 11 1988 – 1989 Jan 2009 RF
- Part 12 1990 – 1991 Feb 2009 RF
- Part 13 1992 – 1993 Mar 2009 RF
- Part 14 1994 – 1995 Apr 2009 RF
- Part 15 1996 – 1997 May 2009 RF
- Part 16 1998 – 1999 Jun 2009 RF
- Part 17 2000 + Index Jul 2009 RF

(Part 17 concludes the OCARC History Series
...Bob Evans, WB6IXN, Club Historian)





The Santa Barbara Amateur Radio Club

Presents the

2009 ARRL Southwest Division Convention & Hamfest

Major
Raffle
Prizes
Every
Hour!

F
O
C
U
S



Woody's
Barbecue
Tri-tip &
Chicken
Lunch!



On Emergency
Preparedness

Saturday, August 15 at Earl Warren Showgrounds*

** go to www.earlwarren.com for map and info*

Exhibits open at 0800 – Speakers begin at 0900 – Live band closes the show at 1700

8,000 sq. feet of indoor exhibits featuring major communications suppliers

Huge outdoor static display of emergency communications & response vehicles

Speakers & panel discussions, such as "Lessons Learned from the Great Southern California Shakeout" by Dr. Kate Hutton of the Caltech Seismology Department

Elmering & Special Interest Group Genius Centers to answer questions from new hams & share expertise on favorite topics such as trouble-shooting, ATV, DX, QRP & many more

Alternative-power Demonstration – latest solar, wind & other "off-the-grid" technologies

Spouse-approved – adjacent to [Santa Barbara Home Show](#) with **FREE** entry privileges

ARRL Forum – update on antenna regulations. Meet & question your elected leaders

Grand raffle prize – new Elecraft K-3! Spouse prizes – valuable restaurant gift certificates!

Register by mail using form on back or go to www.sbarc.org & follow the links!

Santa Barbara Amateur Radio Club

2009 ARRL Southwest Division Convention &

Hamfest *early* Registration

Package 1 – SBARC Members

			Price	Quantity	Total
Barbeque Lunch	+ 5	Ham Raffle Tickets*	\$10		
	+ 5	Additional Ham Raffle Tickets	\$5		
	+ 25	Additional Ham Raffle Tickets	\$20		

Package 2 – SBARC Spouses/SO's**

Barbeque Lunch	+ 10	Spouse Raffle Tickets*	\$10		
	+ 10	Additional Spouse Raffle Tickets	\$5		
	+ 50	Additional Spouse Raffle Tickets	\$20		

Package 3 – Non Members

Barbeque Lunch	+ 5	Ham Raffle Tickets*	\$20		
	+ 5	Additional Ham Raffle Tickets	\$5		
	+ 25	Additional Ham Raffle Tickets	\$20		

Package 4 – Non Member Spouses/SO's**

Barbeque Lunch	+ 10	Spouse Raffle Tickets*	\$15		
	+ 10	Additional Spouse Raffle Tickets	\$5		
	+ 50	Additional Spouse Raffle Tickets	\$20		

Name		Total \$
Address		
City/State/Zip		
Call	Phone	E-mail

* Bonus raffle tickets given only for early registration - Pick up ticket packages at show entrance

** Significant Others - No charge for children under 10

Send checks made out to SBARC to SBARC, PO Box 3907, Santa Barbara, CA 93130

OCARC**Board Meeting Minutes****2009-07-11**

The OCARC Board meeting was held at the JagerHaus Restaurant in Anaheim at 8:15AM on Saturday, 2009-07-11. There were a total of 11 members and visitors attending. There was a quorum of directors present, with following officers absent: Kris-KC6TOD, George-N6VMNI, and Dan-N6PEQ.

DIRECTOR REPORTS:

- **Vice President** – Kristin-K6OEQ reported that the following programs are planned:
 - July is Radio Astronomy
 - August is Southern Calif Edison
 - September is Bob Grimmick - N6OX
 - October is OCARC Auction
 - November is Gordon West WB6NOA
 - December is the OCARC Holiday Dinner
- **Treasurer** – Paul-W6GMU reported that the club had \$4,471 in the bank, although not all FD bills have been received.

OLD BIZ:

- **RF NewsLetter “Rotating” Editors**
 - July is Kristin K6PEQ
 - August is Nicholas AF6CF
 - Sept is Paul W6GMU
 - October is Bob AF6C
- **OCARC QSL Card**
 - The QSL card for the club is almost ready to be ordered. The club just needs to select which photograph should go on the QSL card for W6ZE.
 - Kristin-K6PEQ suggested that when the FD photos are up on the WEB...the club members vote on their favorite PIX for the QSL design.
- **Morse Code Class**
Kristin-K6PEQ reported that everything was ready for a Morse Code class that afternoon at 1:30 PM (Saturday July 11).
- **Field Day Report**
FD Chairman, Paul-W6GMU, reported that everything went well at Field Day. The location was perfect, set-up went smoothly, the scores

were second-highest in club history, the turn-out was great, the food was delicious, and there were plenty of people for tear-down. It was a terrific FD!

- **Donation to Club**

Bob-AF6C has successfully sold off a classic Drake radio station that had been donated to the club by Clem WØMEC of Westminster. Bob presented a check of \$733 from the proceeds to club Treasurer, Paul W6GMU

NEW BIZ:

- **OCARC Motion Rules Reviewed**

Nicholas-AF6CF requested a review of the process used by the club for making a motion of business. Without a formal vote, the board agreed on using the following process that had been used for several years:

– OCARC General meetings....

- a) any member can make a motion
- b) any member can second a motion
- c) any member can discuss a motion
- d) any member can vote on a motion

– OCARC Board meetings....

- a) any director can make a motion
(although, usually the president refrains)
- b) any director can second a motion
- c) any member can discuss a motion
- d) any director can vote on a motion

- **OCARC Post Office Box**

Kristin-K6PEQ reported she found that the club PO Box had been closed up because the bill had not been paid. She paid for 1-year of rent. Kristin requested that members put a reminder into their iPhones in order to pay on time next year.

GOOD OF THE CLUB:

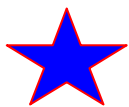
- **Move the Board Meeting Schedule?**

Rich-KE6WWK, noting that we had a very quiet meeting room and that the parking lot had lots of spaces, asked if we should consider always holding breakfast/board on the second-Saturday of the month. The general consensus was that would put a hard “squeeze” on getting the newsletter out before meetings. Agreement was to leave as is.

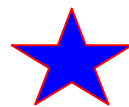
Submitted by: Ken Konechy W6HHC
acting-Secretary

4th of July Word Search

D	X	I	G	N	E	L	M	E	S	R	M	E	E	T	I	N	G	S	F
X	E	M	M	A	H	E	V	M	B	T	C	A	D	G	H	E	A	U	N
I	A	C	F	Z	M	H	L	E	U	C	L	O	V	R	O	T	O	P	E
O	C	O	U	T	E	A	H	M	I	F	U	D	S	U	S	H	G	P	V
I	T	U	A	R	M	M	T	B	X	A	B	Y	U	O	R	A	N	G	E
D	I	N	H	H	V	S	M	E	C	F	H	E	A	R	G	N	T	G	L
A	V	T	E	L	F	F	A	R	U	D	H	S	U	P	P	K	J	D	B
R	I	L	L	W	U	B	D	H	E	R	R	O	P	P	U	S	A	C	T
Q	S	U	T	E	X	A	U	L	E	F	N	T	I	N	R	E	M	L	E
F	R	E	E	D	O	M	L	E	C	V	L	D	F	E	I	H	R	F	V
H	A	M	Q	U	E	D	C	O	U	N	T	Y	R	T	H	A	N	S	E
A	R	T	S	O	R	A	N	R	V	J	B	S	U	L	C	L	U	V	N
S	H	N	D	E	I	R	F	A	I	E	E	M	E	E	T	I	G	N	T
D	R	C	N	C	L	U	H	G	V	V	L	S	H	G	A	U	M	B	S
V	A	L	E	N	T	I	N	E	O	E	F	R	E	I	N	D	S	N	U
J	F	U	I	D	N	R	A	F	L	N	J	A	L	B	U	I	L	C	F
O	F	S	R	U	F	A	T	R	C	P	E	H	E	L	O	F	X	F	U
R	E	B	F	B	M	F	D	A	C	T	I	V	I	T	I	E	S	D	B
A	I	N	H	C	J	F	V	H	L	O	V	D	W	X	O	R	A	N	H
N	S	E	R	V	E	L	H	E	A	R	S	U	P	P	O	R	T	Y	M



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TechTalk #76**Digital-ATV – Understanding Symbol-Rates, FEC and RF Bandwidth**

by Ken W6HHC
with additional Bandwidth info by Hans DC8UE
(updated 2010-01-27)

In the May 2009 newsletter, TechTalk presented an introduction to D-ATV. Then in the June newsletter, Robbie-KB6CJZ and I teamed-up to present a top-down approach for planning a DATV Station that resulted in selecting the DVB-S standard. This month, TechTalk will explain a few Digital-ATV concepts that are typically not understood by hams and even analog ATVers.

Using the DVB-S standard to transmit a digital ATV signal involves:

- QPSK (Quadrature Phase Shift Keying) modulation
- FEC (Forward Error Correction) algorithms
- MPEG-2 compression data rates for video
- Video bit-rate needed
- Net Data bit-rate available
- Symbol-Rates
- RF Bandwidth

This article will now walk through these various DATV factors and arrive at determining the resulting RF bandwidth for DVB-S.

Video Data-Rate and Compression

For DATV, the analog camera output is first digitized by the MPEG-2 Encoder board shown in **Fig 1**, and then compressed by the MPEG-2 algorithm. The reason the compressed video data rate varies in **Table 1** is that the low value means little motion in the video scene and the higher value means a lot of motion.

Notice in **Table 1** that the uncompressed NTSC camera video stream is 168 Mbits/sec, while the uncompressed PAL camera video stream is 216 Mbits/sec. The NTSC video stream data-rate is a 22% reduction from PAL.

Table 1 – Camera Video Data Streams and MPEG-2 Data Streams

Video Data Stream	Data-Rate	Notes
Analog NTSC camera	168 Mbits/sec	A/D digitized, uncompressed
NTSC MPEG-2	2-3 Mbits/sec	compressed
VHS MPEG-2	1-2 Mbits/sec	compressed
Analog PAL camera	216 Mbits/sec	A/D digitized, uncompressed
PAL MPEG-2	2.5-6 Mbits/sec	compressed
HDTV camera	1-1.5 Gbits/sec	uncompressed
HDTV MPEG-2	12-20 Mbits/sec	compressed

Stefan-DG8FAC of SR-Systems (located in Germany...see links at the end) has explained to me that in Europe many hams set the MPEG-2 output data-rate to be 2.5 Mbits/sec for PAL. Stephan further suggests that the MPEG-2 output data-rate for NTSC would be about the same. I suspect that there should be about a 22% reduction in MPEG-2 output data-rate from PAL, to about 2.0 Mbits/sec. I will plan for a 2.5 Mbits/sec video stream, but when I finally put together my station DVB-S transmitter, I will measure the NTSC MPEG-2 output to see if the data-rate can be reduced to a 2.0 Mbits/sec video stream.

FEC Inflation of Video Stream Data-Rate

Forward Error Correction (FEC) is a technology that not only can detect an error on the received signal, but adds enough redundancy of the data so that it can correct the wrong bit. It can correct two wrong bits. Since redundancy increases the data-rate of the video stream, there is a trade-off between more redundancy and the required video data-rate becoming too large. As we will see a little later in this article, the larger the video stream data-rate, the higher the required RF bandwidth. So at some point the FEC algorithm will not have enough redundancy to correct too many errors, and the DATV screen will go blank.

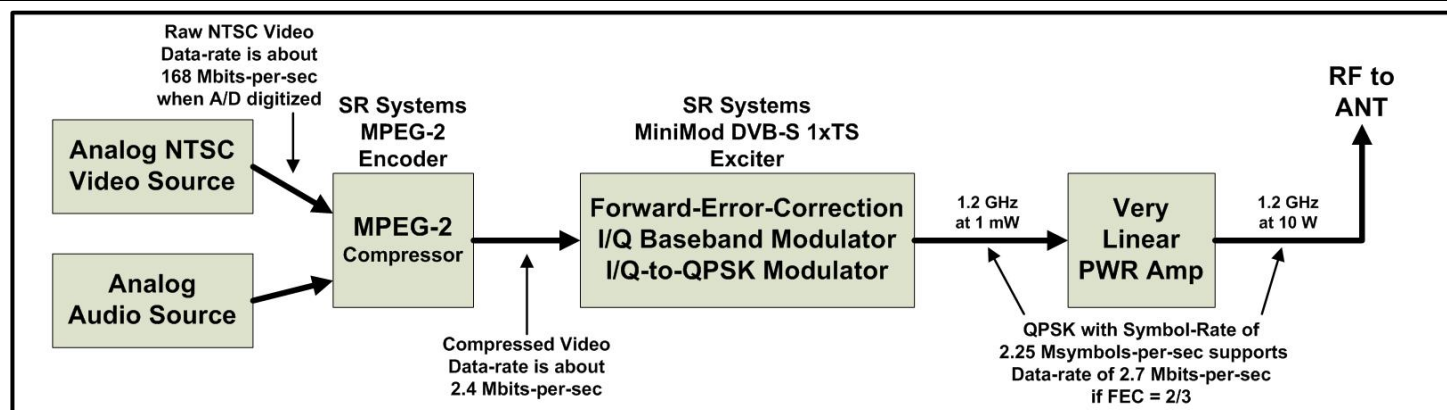


Figure 1 – DATV Block Diagram Showing Various Data-Rates and Symbol-Rates for DVB-S QPSK (for 2.25 Msymbols-per-sec, the Bandwidth is 3 MHz)

DVB-S commercial television standard uses two different Forward-Error-Correction (FEC) algorithms together in order to provide protection against noise errors and multi-path errors. The first FEC algorithm is called Viterbi. The second FEC algorithm is called Reed-Solomon.

The Viterbi FEC algorithm can be configured for different levels of error correction. These different Viterbi configuration/redundancy settings are usually called: 1/2, 2/3, 3/4, 5/6 and 7/8. The first number (“1” in the case of configuration 1/2) is the number of input bits. The second number (“2” in the case of configuration 1/2) is the number of output bits from the FEC_{viterbi} algorithm. So the MPEG-2 output data stream is “inflated” 100% by this FEC algorithm configured for 1/2. That is...for every bit going into the FEC engine, two bits come out. A FEC_{viterbi} algorithm configured for 3/4, for example, would inflate the MPEG-2 output data stream by 33%. So FEC levels can really inflate the data-bit-rate going to the RF modulator; the MPEG-2 algorithm compresses the video stream, but the FEC algorithms start to expand the required data-bit-rates again.

The Reed-Solomon FEC algorithm has a fixed configuration. Its data stream “inflation rate” is 188/204. So for every 188 bits going into the FEC_{reed-solomon} algorithm, 204 bits come out...an additional FEC inflation of 8.5%.

Digital Modulation Symbols and Symbol-Rates

Digital modulation technology like BPSK (for example PSK-31), QPSK (Quad Phase Shift Keying – like DVB-S) and QAM256 (Quadrature Amplitude Modulation with 256 “constellation points”) have the ability to put more information into a narrow frequency spectrum than analog modulation. The complexity of the digital modulation scheme, allows us to pack

more “data bits” into each SYMBOL. Table 2 lists out how many data bits can be packed into a symbol for several well known digital modulation technologies.

Table 2 – Symbol Bit-Packing for Various Digital Modulation Technologies

Modulation Scheme	Data Bits per Symbol (Me)
BPSK	1
QPSK	2
8-VSB	3
QAM16	4
QAM256	8

Table 2 means that QPSK will pack two data bits into each symbol being modulated. If we know the final output data-bit-rate (I will call this inflated data rate the “Gross Data-Bit-Rate”) we need for the television signal, then the “symbol-rate” we need is exactly one-half of that data-bit-rate. For example:

$$\text{Gross Data-Bit-Rate} = 4.5 \text{ Mbits/sec}$$

$$\text{Symbol-Rate Needed} = 2.25 \text{ Msymbols/sec}$$

The formula to calculate the Symbol-Rate setting that I need for my DVB-S transmitter is:

$$\text{Symbol-Rate Needed} = \text{NDBR} / (\text{Me} \times \text{CRv} \times \text{CRrs})$$

Where:

- NDBR = Net Data Bit Rate (aka the information rate)
Same as MPEG-2 output data rate in Table 1
- Me = Modulation Efficiency (2 for QPSK in Table 2)
- CRv = Correction Rate setting for Viterbi (1/2, 3/4, etc)
- CRrs = Correction Rate value for Reed-Solomon is 188/204

I will now calculate an example for QPSK where the output of MPEG-2 is 2.4 Mbits/sec and FEC_{viterbi} is set to 1/2.

Table 3- Net Data Bit-Rates for DVB-S at a given RF Bandwidth

Modulation	FEC Code Rate	DVB-S RF BANDWIDTH for DATV (RF BW = SymbolRate x 1.33)					
		2.0 MHz (SR = 1.5 MS/sec)	2.5 MHz (SR = 1.88 MS/sec)	3.0 MHz (SR = 2.25 MS/sec)	4.0 MHz (SR = 3.0 MS/sec)	5.0 MHz (SR = 3.75 MS/sec)	6.0 MHz (SR = 4.50 MS/sec)
QPSK	1/2	1.38	1.73	2.07	2.76	3.46	4.15
	2/3	1.84	2.30	2.76	3.69	4.61	5.53
	3/4	2.07	2.59	3.11	4.15	5.18	6.22
	5/6	2.30	2.88	3.46	4.61	5.76	6.91
	7/8	2.42	3.02	3.63	4.84	6.05	7.26

(NOTE-1: NTSC Analog Camera produces about 2.4 to 2.5 Mbits-per-sec of MPEG-2 output for Ham Radio type broadcasts)

(NOTE-2: The Net Data Bit-Rate values inside the Table need to be at 2.4 Mbps or larger to support the expected camera data rate coming from MPEG-2 encoder)

(NOTE-3: The Net Data Bit-Rate values inside the Table shown in RED (with strikethrough) are Net Data Bit-Rates that will not support the video data stream.)

TechTalk – DAVT – cont'd from Pg 17

$$\text{Symbol-Rate Needed} = \frac{2.4 \text{ Mbit/sec}}{2 \text{ bits/symb} * (1/2) * (188/204)}$$

$$\text{Symbol-Rate Needed} = \frac{2.4 \text{ Mbit/sec}}{0.921 \text{ bits/symbol}}$$

$$\text{Symbol-Rate Needed} = 2.65 \text{ Msymbol/sec}$$

If I change the FEC_{viterbi} setting to 3/4, then the CRv value becomes 3/4 and the results are:

$$\text{Symbol-Rate Needed} = 1.73 \text{ Msymbol/sec}$$

The Symbol-Rate that is needed was reduced because the “inflated data-rate” caused by a lot of FEC redundancy was reduced. If you look at **Table 3** on the preceding page, it shows the Net Data Bit Rate that can be supported by a particular Symbol-Rate using several FEC settings. The FEC setting needs to result in a number of Net Data Bit Rate that is at least 2.4 Mbits/sec. The red values in the table show FEC settings or Symbol-Rates that result in a Net Data Rate of less than 2.4 Mbits/sec that I set as my goal for MPEG-2 video stream output.

RF Bandwidth for DVB-S DATV

It turns out, one of the advantages of digital-ATV is it can be more bandwidth-efficient than analog ATV. With QPSK modulation you actually have the ability to easily make the DATV RF bandwidth as narrow as 2 MHz or 3 MHz without giving up any noticeable quality. This is because the commercial DTV standards planned to transmit several Television streams inside one normal (old) RF TV bandwidth.

The final formula is for DATV Bandwidth (BW). For QPSK modulation, the formula for (allocation) RF BW is:

$$\text{RF BW}_{\text{allocation}} \sim 1.33 \times \text{Symbol-Rate}$$

This Bandwidth is the spacing that can be used for placing adjacent DATV station center-frequencies. This value of Bandwidth is where the signal is down about -26 dB or more. (NOTE - see additional Bandwidth discussions on Pg 18A.)

The expression "occupied bandwidth" is sometimes used to refer to a bandwidth that is 1.19 times the symbol rate, where the signal is down by approximately -10 dB.

If the Symbol-Rate used is 2.25 Msymbols-per-sec, then:

$$\text{RF BW} = 1.33 \times 2.25 \text{ Msymbols/sec} = 3.0 \text{ MHz}$$

If we can use a Symbol-Rate of only 1.5 Msymbols/sec, then the bandwidth would reduce to:

$$\text{RF BW} = 1.33 \times 1.5 \text{ Msymbols/sec} = 2.0 \text{ MHz}$$

Again, **Table 3** on the preceding page provides an overview of what RF Bandwidth you can choose and what the resulting Net Data Bit Rate will be for various FEC selections.

Conclusion

In reviewing the results in **Table 3**, I have concluded that I will use an RF Bandwidth of 2.5 MHz to support an NTSC MPEG-2 output of 2.4 Mbits/sec by selecting FEC to be 3/4. I plan to put together a DATV station soon. When I do, I will measure the NTSC MPEG-2 video stream that is really required. If my suspicions that I will see a NTSC MPEG-2 video stream at around 2Mbits/sec are confirmed, then I probably will change to a 3 MHz RF BW by using the FEC setting of 1/2. This FEC setting will produce high DATV signal correction capability in one-half of the normal 6 MHz analog ATV bandwidth.

Useful DATV Links

- AGAF D-ATV components (Boards) – see www.datv-agaf.de and www.AGAF.de
- SR-Systems D-ATV components (Boards) – see www.SR-systems.de
- British ATV Club - Digital Forum – see www.BATC.org.UK/forum/
- DXzone links on Digital-ATV – see www.DXzone.com/catalog/Operating_Modes/Digital_ATV/
- Amateur Television of Central Ohio – see www.ATCO.TV
- OCARC newsletter introduction article “ATV – the Digital Fork in the Road” – see www.W6ZE.org/DATV/TechTalk74-DATV.pdf
- OCARC newsletter article “Planning a Digital-ATV Station” – see www.W6ZE.org/DATV/TechTalk75-DATV.pdf
- Orange County ARC newsletter entire series of DATV articles – see www.W6ZE.org/DATV/
- Rob-MØDTS D-ATV site including details of F4DAY-design – see www.MØDTS.co.uk/datv.htm
- RF Bandwidth online calculator for DVB-S & DVB-S2 – see www.satellite-calculations.com/Satellite/bitrates.htm
- Ultimate Resource for Digital Amateur Television – see www.D-ATV.com

Further Discussions on DVB-S RF Bandwidth

Through research on the internet, I have confirmed that there are three methods for defining RF BandWidth for QPSK modulation. Hans DC8UE was kind enough to provide me some additional details on the various methods of describing bandwidth below. Hans DC8UE's contributions are indicated as:

[Contributed by DC8UE - For the definition of the RF-bandwidth used with QPSK-modulation, I have added some remarks, how this notions are used inside a professional field (like satellite-transmissions). These definitions deviate partly somewhere from Ken's earlier nominations. So I have opposed them here again to compare it by yourself]

"minus 3 dB" bandwidth method

With this method, the bandwidth is measured at the points that are down 3 dB. This is a typical method for measuring a filter bandwidth and represents the "half-power point" if you are looking at voltage on a spectrum-analyzer.

Mathematically, $BW_{-3dB} \approx S/R$ for this definition.

[Contributed by DC8UE - The -3dB-bandwidth method is not really useful to grant the bandwidth of a digital signal transmission link. This is because a modulation with a digital -(pulse-)modulation-signal produces a non-Gaussian signal-flank.]

"occupied" bandwidth method

This occupied bandwidth is defined as $BW_{occupied} = 1.19 \times S/R$

The signal level is down by about 10dB at the edges of the occupied bandwidth

[Contributed by DC8UE - As defined by 3GPP TS 34.121 section 5.8 Occupied Bandwidth (OBW) is the bandwidth containing 99% of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency.

How is the occupied bandwidth measurement made? During this measurement, a Gaussian filter with a bandwidth greater than 10MHz and a resolution bandwidth (RBW) of 30 kHz or less is used to measure the distribution of the power spectrum.

First, the total power found in the measured frequency range is calculated. Then, starting at the lowest frequency in the range and moving upward, the power distributed in each frequency is summed until this sum is 0.5% of the total power. This gives the lower frequency value. Next, starting at the highest frequency in the range and moving downward, the power distributed in each frequency is summed until 0.5% of the total power is reached. This gives the upper frequency value. The bandwidth between the 0.5% power frequency points is called the "occupied bandwidth".]

"allocation" bandwidth method

This method provides a little guard-band between adjacent DATV signals.

Allocation bandwidth methods uses formula $BW_{allocation} \approx 1.33 \times S/R$

This formula is equivalent to measuring at down about 26 dB

[Contributed by DC8UE - The "allocation bandwidth" is determined by the big satellite-providers (like inside the Intelsat Earth Station Standard 420: (IESS420e.pdf) as an area , inside that the power-level will be not be lower than -26dB. There will be a filtering necessary on the signal borders (mostly performed by software), which takes care, that the borders rolls out weakly. The grade (slope) of this roll off will be described by the rolloff-factor. It shows the relationship between half of the roll off area to half of the wanted channel-bandwidth.

At DVB-S you will operate with a rolloff-factor at 0.35. A raised cosine filtering at the edge region for the transmission path is required. The used filter generates in a first step only a root raised cosine shape. Only in combination with the same filtering inside the receiver you will get the wanted raised cosine form of the filter shape. After the transmitter, inside the "on the air"-signal, you will find the larger signal shape (shown as the dotted line) in **Figure 3!**

[Continued contribution by DC8UE –

The allocation bandwidth is calculated as $1 + \text{rolloff-Factor} \times \text{Symbol-rate}$

$$(BW_{\text{allocation}} = 1.35 \times S/R)$$

when using a 0.35 Rolloff-factor.

The DVB-S Standard uses a Rolloff-factor of 0.35 for video-transmissions and 0.4 for data-transmission equipment. You may find on newer professional hardware also 0.25 and the new DVB-S2-standard also knows the factor 0.2. This means, the used bandwidth is only 20% bigger than the symbol-rate. The “allocation bandwidth” is in practice really very useful to describe the real used bandwidth.

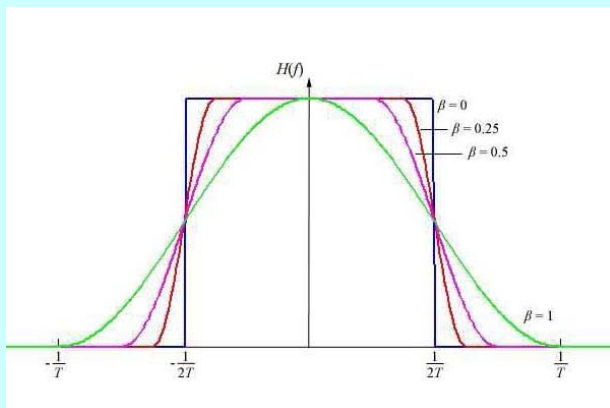


Figure 2 – Different roll-off slopes for different Rolloff-factors

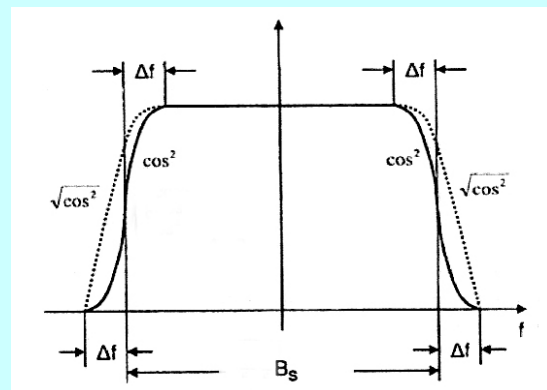


Figure 3 – “On the Air” DVB-S signal has the shape shown as dotted lines

Figure 4, the picture on the right side, shows a D-ATV DVB-S QPSK-signal with a used symbol-rate of 1.5 MSymb/sec (generated by a MiniMod). It shows clearly 2.025 MHz of used bandwidth. Below 35dB you can see the additional shoulders, generated by intermodulation on the non-linear characteristic curves of the equipment being used. A value of 42 dB for the shoulder seems to be normal for the single MiniMod exciter. But, the following PA can increase the power levels of the shoulders to extremely poor values, if the power amplifier is driven too hard. It is extremely important, to avoid saturation in the amplifier and to operate the signal path and the PA in a linear mode.]

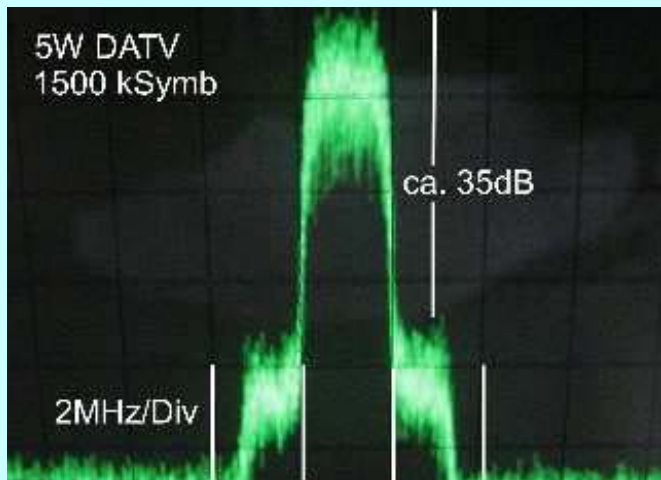


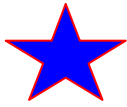
Fig 4 – DATV QPSK signal at 1.5 M Symb/sec produces 2.025 MHz of bandwidth

An ONLINE BW CALCULATOR is listed in Useful DATV Links.

It seems to me that the “allocation” method for describing bandwidth is the most meaningful value of bandwidth for people trying to determine how many DATV stations to squeeze into a band plan. Significant power would overlap neighboring frequencies if we spaced several DATV stations “shoulder-to-shoulder” on their 1/2-power-points...hence creating potential receiving interference. Especially, if several DATV repeaters are located on the same hill-top or tower so that receiving antennas are pointing in the same direction to adjacent DATV repeaters. Hans DC8UE and I both agree that hams should only use the term **BW_{allocation}** when they talk about DVB-S.

On-foot foxhunt at Craig Park

July 18, 2009

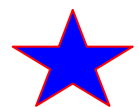


The next on-foot direction-finding session will be Saturday, July 18, 2009 at Craig Regional Park for beginner and intermediate level transmitter hunters. All ages are welcome, so bring the family. A ham radio license and/or knowledge of radio equipment is not required. Experts will be on hand to teach you the basic techniques of on-foot direction-finding. □ If you are a beginner, there will be plenty of simple two-meter fox transmitters just for you. For radio-orientees of average experience, there will be a 5-fox two-meter international-rules course of low to moderate difficulty. A transmitter on the 80-meter band will also be available to hunt. Course setter will be Joe Moell KOOV. There will be no charge for the transmitter hunts. □ □ The main 5-fox hunt begins about 10:30 AM. Hunters may start the courses at any time until 1 PM. Courses close at 3 PM. □ □

If you don't have the antenna/attenuator system for on-foot foxhunting on two meters with your ham radio handi-talkie or scanner, you can easily make one right before the hunts start. Beginning about 9:00 AM, Marvin Johnston KE6HTS will conduct a clinic for building his kits for measuring-tape yagis (\$15) and for 90 dB offset-type attenuators (\$18). For \$40, you can get the yagi kit and an assembled/tested attenuator in a special housing that goes inside the boom of the yagi. If you register in advance by sending e-mail to marvin@west.net, he will have the kits reserved in your name waiting for you. □ □ It takes about an hour to put the two kits together with tools and soldering irons that will be provided. If you're not an electronic technician, don't worry because there will be plenty of experts to help you. We want you to succeed! Then with your HT and the kitbuilt equipment, you will be all set to hunt. □ □ Craig Regional Park is between the cities of Fullerton and Brea. It is bounded on the west by State College Boulevard, on the north by Imperial Highway, on the east by the 57 freeway and on the south by Bastanchury Road. See the maps at homingin.com for navigation to the park and to the start point. From the 57 freeway, take the Imperial Highway exit, go west to State College (first light), turn left (south) and look for the park on your left (east). This is the only vehicular entrance. □ □ Vehicular entrance and parking within Craig Park costs \$5, although you can park just outside along the street for free. Hunt starting point will be at the north end of the park, just south of the walkway. If you're driving in, turn left into the first parking lot after the entry gate. If you park outside and walk in, turn to the left and take the sidewalk to the north end. Look for the orange and white orienteering flag. □ □ Two meter talk-in is on K6QEH/R, 146.97(-) PL 136.5. □ □

73,

Joe Moell KOOV □ www.homingin.com □



OCARC General Meeting Minutes June 19, 2009

The OCARC June General Meeting was held at the Red Cross complex in Santa Ana at 7:00 pm on Friday evening June 19, 2009. There were a total of 47 members and guests present. There was a quorum of directors present, with the following officers absent – Bob Eckweiler AF6C and Rich Helmick KE6WWK.

Our guest speaker needed no introduction – Chip Margelli K7YA from Heil Sound. Chip's program was "How & Why of Human Hearing". As Chip was beginning his presentation he shared his experience of traveling to HAMCON in Plano, Texas, a flying nightmare to say the least. Heil Sound is now introducing the top of the line ProSet Quiet Headphone. Chip illustrated through graphs and sounds, different tones at different levels, sound pressure and frequency depth of loudness. The new Heil headphones have equalizers built into microphone. The new HC4 is the element of choice for DX. Chip shares his vast knowledge and experience to all Hams from the novice to the most experienced DXer. His presentation was greatly enjoyed by everyone.



Fig 1 – Chip K7JA from Heil Sound explains some of the new Microphone Elements.

Nicholas asked Field Day Chairman Paul W6GMU and Co-chairman Dino KX6D to give an update as to Field Day 2009. As you can see in the picture below it was just like Patton's address to the troops (this was Ken's idea)!

The plans are set for the Walter Knott School to be the site. The Walter Knott School has plenty of parking, the entrance from the West side of the campus, trees and shade as well as use of the restrooms. All equipment is being secured and the Band Captains are in place. We will be 9A for W6ZE. Catalina will be represented working 20 meter phone with at least six members. Many members of WARA will be present as they are also members of ORARC. The Chuck Wagon is all

set with suggestions for favorite beverages from the team members. Set up is to be at 11:00 am on Friday.



Fig 2 – FD Chairman Paul-W6GMU and Dino-KX6D explain club plans for Field Day

With Field Day the primary discussion and work in progress, the remainder of the meeting was dedicated to this subject.

Motion to adjourn made by Loran KD6LRD, seconded by Steve N1AB, meeting adjourned 8:40pm.

Raffle to follow.

Respectfully Submitted by:
Kristine Jacob KC6TOD
OCARC Secretary

Heathkit of the Month: by Bob Eckweiler - AF6C

The TX-1 Apache HF Transmitter:

Overview:

As you know from my earlier articles, Heathkit, in the late 50's and early 60's, liked to name their ham equipment after American Indian tribes. The ***TX-1 Apache*** is one of these ham kits.

The *Apache* is a high frequency amateur transmitter that covers 80 through 10 meters. It was manufactured way before the WARC bands so 30, 17 and 12 meters are not covered, nor is the 160 meter band. The *Apache* runs 180 watts on CW and 150 watts on AM using high-level plate modulation. With the optional Heathkit SB-10 SSB adapter it can run 180 watts PEP on SSB.

The *Apache* replaced the DX-100B in 1958, though the popular DX-100B continued in production for two more years until 1960. The *Apache* kit was originally priced at \$229.95 in the Heathkit catalog, and was produced until sometime in 1964, when it was replaced by the Heathkit SB-400 CW/SSB transmitter. An interim HX-10 CW/SSB/AM transmitter called the ***Marauder*** was offered from 1962 to 1965; it physically looks very similar to the *Apache* but adds SSB and uses low-level modulation on AM. The *Apache* transmitter is the companion for the *Mohawk* HF ham-band receiver (See Heathkit of the Month for March 2009). The *Apache* physically looks identical to the *Mohawk* and shares the identical 19-1/2"W x 11-5/8"H x 16"D green cabinet.

Construction:

If you lift the two units the *Apache* will be easy to distinguish from its companion *Mohawk* receiver. The *Apache* weighs in at a very hefty 107 pounds. Much of this weight comes from five large hunks of potted iron - three of these mount along the back of the chassis; the power transformer, the plate power transformer and the associated choke. Nearby sits the modulation transformer. Another choke is mounted under the chassis for the low-voltage power supply. Above the chassis is a cage that shields the two final tubes and pi-network output; the cage is topped by a small fan motor that cools the final tubes. Also atop the chassis is a shielded box that houses the VFO. Like the *Mohawk*, the *Apache* has a drum dial that rotates with the bandswitch so that only the dial marking for the selected band is visible. Near the front of the chassis is the series of gears, pulleys and levers that operate the drum, drive the VFO tuning, link the band-switches and operate the loading control.

The under side of the chassis is divided into four shielded sections. One section contains the under chassis wiring for the audio circuits, another the low-level RF circuitry, a third the RF amplifier input circuitry, and a fourth that contains the wiring for the power supplies and all the bypassing for the rear panel connections. No printed circuit boards are used; all the wiring is point to point.

The Front Panel:

The front panel of the *TX-1 Apache* includes a multipurpose meter and a long slide-rule VFO

frequency dial. Both are recessed and set off with a metal frame. When the transmitter is on, the meter and dial are lighted. A large tuning knob operates the VFO and moves the slide rule dial pointer.



**Heathkit TX-1 Apache AM/CW Transmitter
(Operates SSB with SB-10 SSB Adapter)**

The center group of controls are (from left to right and top to bottom):

High Voltage On - Pilot Light

TUNE/OPERATE - toggle switch

POWER: ON/OFF - toggle switch

METER: DRIVER, GRID current, **FINAL** plate current, **HV, MOD**ulator current - rotary switch.

STANDBY/OPERATE: toggle switch

Final **LOADING: 0 - 10** - capacitor

DRIVER Tuning **0 - 10** - capacitor

DRIVE Level - potentiometer

VFO

SPOTTING - push button

The bottom row of controls (from left to right) are:

MIKE connector (Amphenol series 75)

Audio **GAIN**

Mode **CW, SSB, AM** - rotary switch

XTAL/VFO - rotary switch

FINAL tuning **0 - 10** - capacitor

BAND 80, 40, 20, 15, 10 - rotary switch

KEY - 1/4 inch phone jack

Note: bold letters indicate the front panel nomenclature.

Tube Lineup:

The Apache utilizes eighteen tubes marked V1 to V19. There is no V13; that this was omitted for superstitious reasons seems unreasonable. Perhaps V13 was to be the rectifier tube for the -150 volt bias supply, and was replaced by selenium rectifiers prior to production. Two selenium rectifiers are used in the full-wave -150 volt bias supply. Another single selenium rectifier is used for the negative modulator bias supply.

V1	6AU6	VFO
V2	5763	Driver
V3	6CL6	XTAL Oscillator/Buffer
V4	6AQ5	Clamper
V5	6146	Final Amplifier
V6	6146	Final Amplifier
V7 a	12AX7	Audio Preamp
V7 b	12AX7	Audio Amplifier
V8 a	12AU7	Audio Amplifier/Clipper Driver
V8 b	12AU7	Audio Amplifier
V9	12BY7	Audio Driver
V10	6AL5	Clipper Diodes
V11	EL34	Modulator
V12	EL34	Modulator
V13	-	not used
V14	5V4G	Low Voltage Rectifier
V15	5R4GY	Plate Voltage Rectifier
V16	5R4GY	Plate Voltage Rectifier
V17	0B2	Screen Voltage Regulator
V18	0B2	Screen Voltage Regulator
V19	0A2	VFO Voltage Regulator

(and three selenium rectifiers for the bias supplies).

Circuit Description:

VFO:

The VFO uses a single 6AU6 operating as a Clapp oscillator. It has three output ranges dependent upon band: 1,750 - 2,000 KHz on 80 meters, 7,000 - 7,175 KHz on 20 and 15 meters and 7,000 - 7,425 for 40 and 10 meters. Stability is achieved by the use of temperature compensating capacitors,

an 0A2 voltage regulator tube stabilizing the VFO plate voltage and a separate filament transformer that keeps the VFO tube's filament on continuously.

RF Buffer/Crystal Oscillator:

The output of the VFO goes to a 6CL6 buffer stage. This stage provides buffering as well as some frequency doubling. It's output is 3.5 MHz on 80 meters, 7.0 MHz on 40 through 15 meters and 14 MHz on 10 meters. The buffer stage operates as a Colpitts crystal oscillator when XTAL operation is selected.

RF Driver:

The buffer output goes to the 5763 power pentode driver circuit. This stage operates straight through on 80 and 40 meters, as a doubler on 20 and 10 meters and as a tripler on 15 meters. Drive level is controlled by a front panel potentiometer that controls the driver tube screen voltage. Driver output is tuned by a fixed load pi-network.

Final Amplifier and Clamper:

The final amplifier uses a pair of 6146 transmitting tetrodes operating in Class C on CW and AM phone and in Class AB1 (linear) on SSB. A 6CL6 clamper circuit protects the final tubes when in the AM and CW mode. Final grid drive is also fed to the clamper tube. Should drive be lost the clamper tube starts to conduct heavily. Since the tube's plate is connected to the final screens, the reduction in screen voltage limits the final plate current. In SSB mode the clamper is not needed since the tubes are operating in linear class; the clamp circuit is switched out and the final screens are connected to two series connected 0B2 voltage regulator tubes to provide a fixed 210 VDC screen voltage.

Keying:

On CW the *Apache* uses a clever time-delay differential keying circuit. This circuit uses an NE-2 neon lamp to allow the VFO to start and stabilize a few milliseconds prior to bias being removed from later stages; it also keeps the VFO running until after bias is restored when the key is let up. This circuit makes the *Apache* keying very clean. However, after many years of use the NE-2 can begin to fail and cause erratic keying behavior. Fortunately NE-2s are still easily available and inexpensive.

Audio:

The transmitter audio circuit is designed for use with a high impedance microphone, such as the Astatic D-104 that was very popular at the time. Three stages of RC coupled audio pre-amplification are followed by a 6AL5 dual-diode that acts as a clipper. The diodes are biased so that the negative peaks are clipped before the positive peaks. It is the negative peaks that cause splatter when over-modulating. A low-pass filter and an additional stage of audio gain follow the clipper. Two audio gain controls are used - one between the first and second audio stage and a second just before the audio driver. This allows the level of clipping to be adjusted to suit the user.

Amplitude Modulator:

A 12BY7 audio driver pentode brings the audio up to a level that will drive the modulator. A transformer couples the audio to the grids of a pair of EL34 (6CA7) modulator tubes that are configured as a class AB2 push-pull modulator. The modulator is capable of 100 watts of audio output, more than enough to fully modulate the final amplifier. A modulation transformer matches the relatively high 11K ohm plate to plate impedance of the modulator tubes to the 3K ohm impedance of

the final plates. A 500 ohm tap on the modulation transformer's secondary provides high-power low-impedance audio to drive an external modulator should the TX-1 be used as an exciter for a kilowatt amplifier/modulator. The secondary of the modulation transformer is shorted and screen voltage is removed from the modulator tubes when operating in CW and SSB mode.

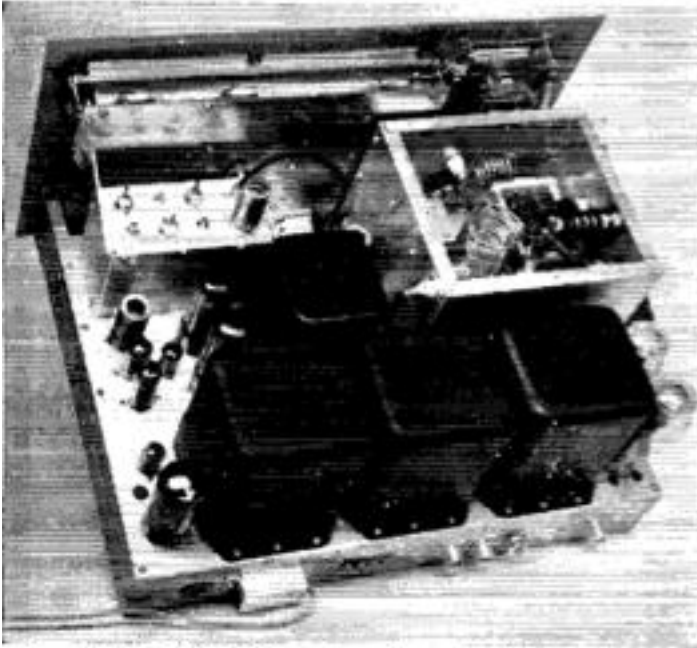
Power Supplies:

Heathkit designed the *Apache* with rugged heavy duty power supplies. The low voltage transformer provides 6.3 VAC heater voltage for all the tubes except the VFO and rectifiers. A second filament winding provides 3.5 amps at 6.3 VAC at the rear accessory socket. Two 5 VAC windings provide filament voltage for the low and high voltage rectifier tubes. The low voltage supply uses a 5V4G rectifier and produces 350 VDC for most of the circuitry including an extra 85 ma available at the rear accessory socket. The low voltage power supply filter is capacitor input and utilizes a 7 henry choke. Taps on the winding of the power transformer secondary supply voltage to two bias supplies, one full-wave for the driver, finals and keying circuit and a second, half-wave, bias supply for the modulator tubes.

The other 5 VAC winding on the low voltage power supply lights the filaments of two 5R4GY full-wave rectifier tubes that are wired directly in parallel. A separate 1800 VCT 400 ma transformer provides a solid 750 VDC through a 5.5 henry choke input filter. Two 125 μ F capacitors in series, each shunted with a 15K ohm bleeder power resistor, provide the filter capacitance. Voltage is tapped off from the center of the bleeder resistors to provide positive bias for the clamp circuit when the plate voltage is present.

Single Sideband Mode:

The *Apache*, can not operate in SSB mode by itself. However it is set up to use the Heathkit SB-10 SSB Adapter. When the *Apache* mode switch is placed in the SSB position the output of the driver is switched to a connector on the rear apron and a second rear connector is switched to the grids of the final amplifier. The mode switch also switches the final amplifier from class C to class AB1 linear so it can amplify the SSB signal without distortion. The SB-10 connects to these two rear connectors. The *Apache* provides heater, B+ and bias voltage as well as other needed connections to the SB-10 through the accessory socket. Maybe we'll cover the SB-10 in a future HotM article?



Heathkit TX-1 Apache Transmitter shown with case and final cover removed.

Personal Experience:

My Heathkit TX-1 *Apache* arrived on July 1st of 1961. Sixteen evenings of fun construction later it was on the air. Construction was not difficult and the unit worked right off the bat. That is more a tribute to Heath's excellent instructions than any building skill I might have possessed. As the kit went together it kept getting heavier and heavier; that is probably the one point I remember most about assembling the TX-1. Another was installing and adjusting the linkage that drove the band-switching, the loading capacitor and the VFO tuning. It was important to be sure they were aligned right for smooth operation. Mine always worked well, though there were complaints about the linkage from others building the kit. Operation was rock solid and I never got any poor audio reports using the *Apache*. I used it mostly on CW and AM, but did get to operate it with a borrowed SB-10 SSB adapter for a few weeks.

The transmitter went into storage when I went off to college. I didn't fire it back up again until moving to Orange, CA. On April 9th 1968, using a Hustler 4BTV vertical and an NC-88 receiver I got back on the air. Most of my contacts in those days were on CW, SSB had pretty much taken over. However, I did operate some AM around 7.280 MHz where a group of AM-ers frequented.

Sometime in the early seventies I sold the *Apache* to Jack - WA6LOH (now W6LOH) who used it on CW for many years. Just a few years ago Jack offered to give it back to me, but alas with no place to put it I declined and it has since found its way to places unknown.

Bob, AF6C